Structural Characterization of HgCdTe Single Crystals Grown by the THM Method in the Absence of a Rotating Magnetic Field *

X19C

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HgCdTe is an important II-VI semiconducting compound being developed for infrared detector applications. Bulk single crystals of high crystalline perfection and compositional homogeneity are required for these applications. The traveling heater method (THM) using Te as solvent is an advantageous technique for HgCdTe growth since it combines the purity advantages of solution growth and zone refining and low temperatures result in reduced Te precipitation. It consists of moving a solution of HgCdTe in Te through a bar of HgCdTe. By proper application of temperature gradients and slow movement of the zone, material is dissolved at the bottom of the zone and re-precipitated in single crytal form on the top. Material transport occurs by convection and diffusion across the solvent zone under the influence of the temperature gradient. Therefore, THM potentially involves both temperature and solutal gradients and thus is considerably subject to buoyancy driven convection on earth. Figures 1 and 2 show synchrotron white beam x-ray reflection topographs taken from wafers sliced from a HgCdTe boule grown by THM. The topographs reveal that the wafers are essentially single crystal but have a very high defect density with large inhomogeneous strains and a mosaic structure composed of several subgrains separated by misorientations of several minutes of arc. Thus, instabilities caused by buoyancy driven convection have resulted in poor quality material.

* Work performed on the Stony Brook Synchrotron Topography Beamline X19C and supported by NASA Marshall Space Flight Center.